

RECENT ENTOMOLOGICAL LITERATURE.

EARLY STAGES OF CARABIDÆ.

Among the recent publications on Entomology is one which is of especial interest to Coleopterists, by Dr. George Dimmock and Mr. Frederick Knab, entitled: "Early Stages of Carabidæ," (Springfield Museum of Natural History, Bulletin No. 1, 1904, pp. 1-55, pls. 1-4). It is certainly a valuable contribution to our knowledge of the larvæ and metamorphoses of the family of which it treats, and is of interest to systematists as well as to students of life history, for, as is every day becoming more apparent, when our knowledge of the early stages of Coleoptera is sufficiently developed, we shall doubtless find that the larval characters will be of much service in determining the correct position of many groups the relationship of which is now more or less obscure.

The article is written by Dr. Dimmock from notes taken by both authors. Plates 1-3 are drawn by Mr. Knab, the fourth plate by Dr. Dimmock.

After a few prefatory remarks, the reader is informed of the method employed by the authors in rearing larvæ, and directions are given for so doing, as well as for the proper study of them. Great stress is laid upon the importance of the study of larval exuviæ, which often "reveal many structures not visible on the larva itself," and instructions are given for mounting on microscope slides in order to preserve them for examination. This is followed by a thorough resume of our present knowledge of the characters of Carabid larvæ, evidently the result of long and careful reading and study. Each character is fully discussed, examples are cited, and references given to an ample bibliography, which closes the paper.

A large part of the paper is devoted to descriptions of the metamorphoses of *Dicaelus purpuratus*, *Brachynus janthinipennis*, *Pterostichus stygius* and *P. adoxus*, those of the last two species having not been described heretofore. Very full and detailed descriptions are given of the larvæ, larval habits, pupa, emergence and changes in color, both before and after emergence. In the descriptions of the larvæ, a system of formulæ is employed, which seems to be a very useful method for the comparison of the jointed appendages of different species, as well as of

the proportionate length of the joints themselves. This is best explained in Dr. Dimmock's own language. With regard to the antennæ, he says: "The proportionate length of the joints of the antennæ differs according to genera and species. It is conveniently shown in descriptions by means of antennal formulæ. They are made up of the successive lengths (relative or absolute) of the joints,—the proximal first, the distal last—with the length of the appendix enclosed in parentheses." The following will serve as an example, the length being given in millimeters:

"Antennal formula in larval exuviae at pupation:

0.38 1.62 1.85 (0.03) 2.15"

The resumé of characters above referred to is so thorough and of such general interest we give it in full, only regretting that lack of space prevents us from adding the copious notes and references which follow the description of each member. Carabid larvæ are thus defined:

"Hexapod larvae with the ventral side of the body straight, i. e., fitted for locomotion on horizontal surfaces; and with nine abdominal segments, the last exerted and bearing an anal tube and almost always a pair of cerci.

"Stigmata rounded, open; one thoracic and eight abdominal pairs; those of the thorax large, at each side of the mesothorax, beneath the anterior angle of the dorsal scute; those of the abdomen smaller, lateral, on each of the first eight abdominal segments. Gills never present.

"Head corneous, porrect, with the very small suctorial mouth usually directed anteriorly and the cervical foramen posteriorly.

"Frontal angles more or less ascending in an oblique direction above the mandibles; in most cases defined by a deep furrow; acute, obtuse or rounded at their apex.

"Epistoma usually included in the vertex.

"Clypeus concrete with the epistoma; labrum wanting.

"Hypostoma usually short and included in the occiput.

"Ocelli usually six on each side, generally on a defined ocellar area, which is often protuberant.

"Antennæ filiform (exceptionally conical), four-jointed, the slender apical joint tipped with sensory setæ. The distal end of the third joint bears an appendicular joint, or appendix, which is sometimes very minute.

"Mouth-parts exerted, free.

"Mandibles falciform, acute, directed forward and somewhat upward, not suctorial, and with a tooth, or retinaculum, on their inner side, at or posterior to their middle.

"Maxillae inserted between the mandibles, near the labium; cardo extremely short, fixed; stipes flattened cylindrical, directed anteriorly. The slender two-jointed exterior lobe (galea) of the maxillae is inserted on the maxillary stipes and is motile. Interior lobe (lacinia) rudimentary or wanting. Genae without maxillary scrobes. Maxillary palpi filiform, three-jointed, sparsely furnished with setae, and borne on a short conical palpigerous stipes (squama).

"The mentum is small, usually transverse, trapezoidal. The stipites of the labial palpi are concrete; taken unitedly, quadrate-clavate. Labial palpi two jointed, often sparsely setose. The ligula generally bears two setae.

"Thorax of three segments, of which the prothorax is longest; each segment, except in rare cases, provided with dorsal scutes.

"Dorsal scutes of thorax concrete at median line, those of the prothorax entire and concealing the sides.

"Praeterga of thorax usually evident, often strigose; praetergum of prothorax the longest.

"Postterga of thorax usually evident, often strigose.

"Sternal scutes of prothorax evident, usually concrete at median line; those of the mesothorax and metathorax minute or wanting.

"Legs six-jointed; consisting of coxa, trochanter, femur, tibia, tarsus, claw (usually double); of moderate length, showing in dorsal view of the larva, when they are extended, at least part of the tibiae and the tarsi and claws.

"Coxae conical, exerted, in length less than four times the thickness of their base; with a (sometimes short inconspicuous) femoral scrobe; increasing in length from fore to hind pair.

"Trochanters clavate, usually shorter than the coxae, and bearing ambulatorial setae.

"Femora clavate, setose, and usually shorter than the coxae.

"Tibiae more or less clavate, more than one-third as long as the femora.

"Tarsi exerted, movable, usually conical-cylindrical; equaling the coxae in length, or shorter; usually longer than the tibiae.

"Claws usually two on each foot. Empodia generally of two very short setae.

"Abdomen straight, more or less depressed, cursorial or ambulatorial, longer than the thorax, and with the dorsum unarmed. Ninth abdominal segment exerted.

"Dorsal scutes, when present, on the abdomen, concrete at median line, and with praeterga and postterga.

"Dorsal scute of the ninth abdominal segment usually present.

"Lateral scutes of the abdomen often defective; when present, exerted, oblong, convex.

“Ventral scutes of the abdomen often defective. When developed, seven on each segment. viz: a large transverse median scute anteriorly; behind this a transverse row of four small scutes, of which the median pair may be concrete; at each side of these five scutes an elongate longitudinal scute. On the eighth and ninth abdominal segments the five median scutes are more or less concrete.

“Anal tube exerted; conical, conical-cylindrical or cylindrical; usually somewhat longer than the ninth abdominal segment, and generally used in locomotion. Anus terminal.

“Cerci, with rarest exceptions, present, and attached to the dorsum of the ninth abdominal segment.

“Habits active, commonly predaceous; usually subterranean, or living under stones or pieces of wood, or beneath loose bark on decaying trees; usually nocturnal, or shunning light.

“Larval stages number three (or four).”

R. H.